NOTES.

PROF. GEORGE FORBES, F.R.S., who has for the last three years been engaged on the utilisation of Niagara Falls, has, we understand, just returned to this country from the United States, the construction stage of the work being now completed. The close of the three years of Prof. Forbes's connection with the great work at Niagara Falls, which marks the change from the period of design and construction to the period of commercial activity in the existence of the Niagara Falls Power Company, forms a fitting opportunity for expressing the sense of gratification that all Englishmen, and the scientific world in particular, must feel in having had one of their countrymen chosen to undertake the important and difficult duties of electrical consulting engineer to an undertaking of such magnitude. The manner in which those duties have been discharged, and the pioneer services which Prof. Forbes has rendered them in respect of the work, have, we are in a position to say, received most gratifying testimony and cordial acknowledgment from his Company, who recognise in Prof. Forbes the scientific attainment, combined with independence of thought and action, which have been invaluable throughout the stage of operations now completed. Few realise the many novel conditions that have had to be met at Niagara Falls. But by dint of years of study of the many problems presented, Prof. Forbes has evolved a system which for completeness, adaptability, and security against breakdowns, had not been dreamt of before. The adoption of the alternating current before its value was fully realised by others, the initiation of the world in the use of a lower frequency than any that has hitherto been employed, and the remarkable confirmation of the foresight as to the economy of large transformers at high electric pressure, even at the low frequency employed, that has been established, are matters for congratulation. Although for fuller particulars of the system and apparatus employed, we must refer our readers to a previous account (NATURE, vol. xlix. p. 482), we may draw attention to the method by which Prof. Forbes met one of the most troublesome questions in connection with the design of the 5000-horse power generators (Fig. 1), arising in consequence of some requirements of the turbine designers—viz. the securing of a certain necessary momentum of the revolving part of the dynamo, without increasing the weight to be supported by the hydraulic piston in the turbine above a certain limit. The difficulty was met by fixing the armature, and revolving the field-magnet, formed of a nickel-steel ring with the pole-pieces pointing radially inwards, outside, the ring, or yoke, and the pole-pieces being supported by a bell-shaped cover fixed rigidly to the top of the vertical shaft from the turbine, the shaft being supported by bearings in the interior of the fixed armature. The fore-seen ability to convert the alternating current into continuous current, and the low frequency into high frequency, which is

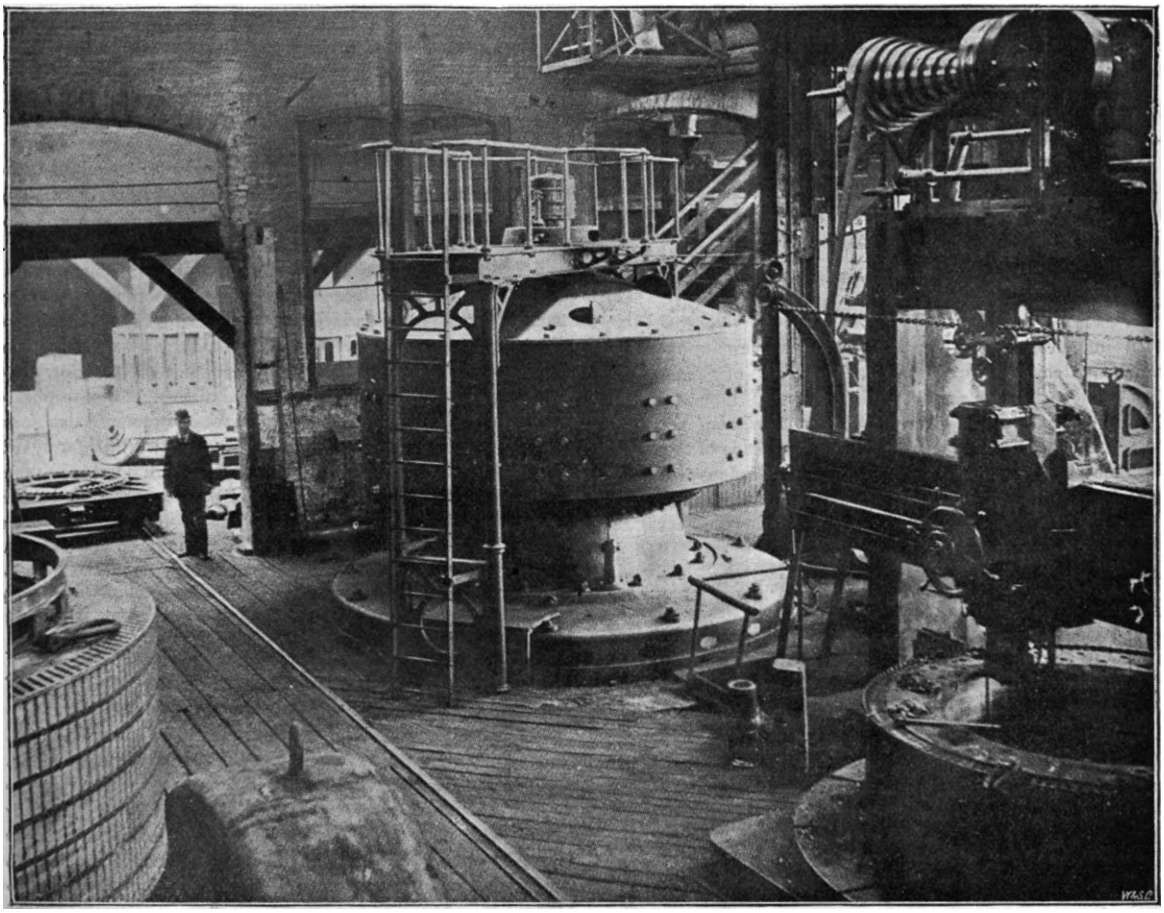

FIG. 1.

now realised in the invention of Messrs. Hutin and Leblanc, gives greater elasticity to the system; while the precautions taken to avoid sudden opening or closing of the circuits, gives a security against troubles experienced in the past by others such as has not obtained before. The success that has attended Prof. Forbes's efforts during the period of design and construction is of good augury for a successful issue to the commercial stage which the Niagara Falls Power Company now enters upon.

REUTER reports that a violent earthquake shock, lasting one minute, was felt at Oravicza, South Hungary, at 10.35 p.m. on December 19. Many houses fell in, while the walls of others were seriously cracked.

A BACTERIOLOGICAL Institute is about to be established in the University of Kieff (says the *British Medical Journal*), at an estimated cost of £10,000. A well-known druggist of Moscow has also given a house, valued at £3000, with £500 towards the fitting up of it as a bacteriological laboratory.

WE regret to record the death, on the 19th inst., of Prof. Allen Harker, of the Royal Agricultural College, Cirencester, at the age of forty-six. Mr. Harker was a popular and successful teacher, and did good work, not only at the College, but in connection with County Council technical education schemes, both in Gloucestershire and Bedfordshire.

THE Italian Botanical Society has decided to hold its annual meeting for 1895 in Palermo, in the latter part of April.

THE influence of the Royal Gardens at Kew upon other Botanic Gardens is strikingly shown in a list of the staffs of botanical departments and establishments at home, and in India and the Colonies, given in the *Kew Bulletin* (Appendix III.). Disciples have gone from Kew to the ends of the world to become directors or curators of Botanic Gardens; indeed, almost every Garden seems to have on its staff someone trained at Kew, or recommended by the Director there. A clearer testimony of esteem could not be desired.

FROM Mr. Carruthers's Report of the Department of Botany in the British Museum for 1893, we learn that the herbarium received some valuable additions during that year by gift and purchase. The most important were Mr. Deby's great collection of diatoms, numbering nearly 30,000 named slides; the late Mr. Jenner's collection of over 6000 specimens of algæ, a collection of over 1000 of the lower cryptogams of Dominica and St. Vincent, presented by the committee for the exploration of the West Indies; and a large number of flowering plants from Malaya, presented by Mr. Ridley.

A RAPID fall of the barometer on Friday, the 21st inst., made it clear that a serious disturbance was approaching our shores from the Atlantic, and by 6 p.m. of that day a "fresh" gale had already set in on the north-west coast of Ireland. During the night the centre rapidly crossed Scotland, and the whole of the United Kingdom experienced severe westerly gales, which occasioned great loss of life and property, and although the storm area subsequently crossed the North Sea, violent north-westerly winds continued during the whole of Saturday. The anemometer at Greenwich on Saturday morning showed a pressure of 29 pounds on the square foot, which is equivalent to a velocity of about 76 miles in the hour; but considering that the centre of the disturbance was at that time at least 400 miles to the north, there is no doubt that considerably higher velocities occurred in other parts of the country. In Scotland the barometer fell more than an inch and a half in 24 hours, and the subsequent rise was even more rapid.

WE have received two numbers of *Biology Notes*, a monthly pamphlet published by the Technical Instruction Committee of the Essex County Council. Under the direction of Mr. Houston the problem of reconciling the practical requirements of this district with a really scientific method of instruction in biology seems to be in rapid progress towards a satisfactory solution. Pioneer lectures are given, short courses for farmers and gardeners on such immediate topics as plant diseases, and systematic and largely practical courses of study in botanical science, at the Chelmsford Laboratory, and at various local centres. In addition, the Chelmsford Laboratory is rapidly becoming a centre for inquiry into, and the discussion of, agricultural problems. During the last three months the influence of ergot on gravid cattle, the toxic effect of bracken fronds, certain samples of foreign hay that had caused disease, and the distribution o potato disease, among other topics, have received attention. The combination of elementary instruction in science, on the one hand, with original inquiry on the other, and the practical simplicity of both departments of work, appear to us to be admirable features, and we would recommend it to the attention of those who are interested in Technical Education in similar districts in other parts of the country.

FIELD experiments of an instructive kind are carried on at the Royal Agricultural College, Cirencester, under the direction of Prof. E. Kinch. A pamphlet just received contains an account of experiments on oats grown this year on twenty-four plots differently treated. The general results were as follows:—The smallest yield of corn was from the plots receiving ammonium salts only, the unmanured plots, and the plots receiving cinereal manures only. The highest yield of corn was from the plots receiving fourteen tons of farmyard manure every year since 1885, followed by the plots receiving cinereals and mineral nitrogen, and phosphates and mineral nitrogen. The largest amount of straw was also given by the plots which had received the larger amount of farmyard manure annually, followed by those receiving mineral nitrogen with phosphates. The withholding of potash appeared to make little or no difference in the yield of straw, but the withholding of phosphates made a difference. The unmanured and cinereal manured plots gave the least straw. Experiments were also made to determine the crops of hay from twenty plots, to which different kinds and quantities and manures had been applied.

THE last issue of the *Zeitschrift für Physikalische Chemie* (vol. xv. part 3, p. 386) contains a paper by Messrs. Raoul Pictet and Altschul on "Phosphorescence at very Low Temperatures," which is of special interest in connection with recent work on this phenomenon. Glass tubes containing the sulphides of calcium, strontium, and barium were exposed to sunlight, and the duration and the extent of the phosphorescence were noted. The various tubes, after having been again exposed to sunlight, were plunged into liquid nitrous oxide, the temperature of which, by rapid diminution of pressure, could be brought to – 140°. After twelve minutes' immersion the tubes were brought into a dark room, and their behaviour carefully observed. At first no indication of phosphorescence could be seen. In a few moments the upper part of the tube, which had not been so strongly cooled as the rest, began to phosphoresce, and gradually the feeble light seemed to spread itself down the tube, the lower part of which, however, glowed much more feebly than the upper. After five minutes the tubes acquired their ordinary vivid colour, without subsequent exposure to sunlight or even to diffused daylight. All phosphorescent substances appeared to behave in this way. Further experiments were then made in order to determine the limits between which these phenomena occurred. For this purpose a quantity of alcohol was cooled to – 80°, and in it a tube containing some phosphorescent substance, after insolation, was immersed. That portion of the tube which was surrounded by alcohol in the outset glowed feebly, but in proportion as it took up the temperature of the cooled liquid its phosphorescence diminished, until at −65° it entirely disappeared. The portion of the tube above the alcohol continued to phosphoresce strongly. After thirty minutes' immersion in the cooled alcohol, the tube was removed, and as it gradually acquired the temperature of the air, the lower portion began to glow. Before the glow—blue, green, or orange in colour, depending on the nature of the metallic sulphide—entirely disappeared, the colour became a faint yellow. It was found by comparative experiments that the alcohol exerted no specific influence on the results. These seemed to be entirely dependent upon the diminution or total cessation of molecular vibrations at the low temperature.

An interesting paper on the Sicilian earthquakes of last August has recently been published by Dr. Mario Baratta (*Boll. della Soc. Geogr. Ital.*, Ott., 1894). The first shock of the series was felt on July 29 at Randazzo, and was succeeded by several other slight shocks, mostly in the Lipari Islands. Then came the severe earthquake of August 7 at 12h. 58m. p.m., and the still stronger one of August 8 at 5h. 16m. a.m. (Greenwich mean time). These affected chiefly the south-eastern slope of Etna, and were followed by more than twenty shocks in the same district, lasting until August 26. The meizoseismal area of the principal earthquake (August 8) is only about 7 km. long and 3 to 4 km. broad, and, as the intensity diminished rapidly outwards, it would seem that the focus cannot have been far from the surface. Moreover, the longer axis of this area runs north-west and south-east, and, when produced, passes through the central crater of Etna. It therefore probably coincides with a radial fissure of the cone, and indeed is not far, if at all, distant from that along which the eruption of 1329 took place. The pressure exerted by the column of lava in the central funnel, or by the forces which have raised it to its present height, may have caused such a fracture to be reopened. Thus, it is not impossible that the recent earthquakes indicate an unsuccessful attempt at a new lateral eruption.

Further details relating to the same earthquakes are given in the *Bollettino Meteorico* (Suppl. 110) of the Geodynamic Office of Rome. The depth of the focus of the principal earthquake, according to Prof. Riccò, was about 4 km. The pulsations were recorded at Rome by the great seismograph, consisting of a pendulum 16 metres long, with a mass of 200 kg.; the first traces at 5h. 17m. 30s., and the principal maximum at 5h. 18m. 55s. The puteometer of the Observatory of Catania shows a trace about 21½ mm. long, indicating a temporary lowering of the well-water, which, in returning, stopped about 4 mm. below its original level.

The additions to the Zoological Society's Gardens during the past week include a Yellow Baboon (*Cynocephalus babouin*, ♀) from Fort Salisbury, South Africa, presented by General Owen Williams; two Grisons (*Galictis vittata*) from Brazil, presented by Mr. H. A. Catlett; a Song Thrush (*Turdus musicus*), a Goldfinch (*Carduelis elegans*), British, presented by Mr. B. M. Smith; a Grenadier Weaver Bird (*Euplectes oryx*, ♂) from West Africa, presented by Lady McKenna; a Wild Cat (*Felis catus*) from Scotland, deposited; five Shore Larks (*Otocorys alpestris*), British, purchased.

OUR ASTRONOMICAL COLUMN.

Advances in Lunar Photography.—MM. Lœwy and Puiseux recently communicated to the Paris Academy a paper on photographs of the moon, taken at the Paris Observatory, by means of the great Condé equatorial. Some of the photographs have been enlarged by Dr. Weinek, and the enlargements seem to have excelled in beauty and detail previous lunar pictures of a similar kind. An examination of the photographs shows that not only can they be used to verify the general features of the moon's surface, as depicted upon the most recent and complete lunar maps, but they also show a number of details and small craters which so far have been omitted from such maps. There are, of course, a number of causes which prevent a single photograph from being an ideal representation of a celestial object, and enlargements are usually regarded with a certain amount of suspicion, for there is always a possibility that interesting formations will be unconsciously manufactured in the process. MM. Lœwy and Puiseux know this as well as anyone; nevertheless, they find that the enlargements undoubtedly reveal new features, and definitely determine the existence of several contested objects. They think an instrument of long focus is essential for the best results, and that the enlargements should not be carried beyond twenty or thirty diameters. One object upon which the photographs have thrown light is the small isolated crater Linné, situated in the middle of the Sea of Senenity. According to Shroeter, Beer, Maedler, Lohrmann, and other selenographers, this crater was distinctly visible up to 1866, when Schmidt announced its disappearance. It was afterwards discovered again, but was much smaller than when described and figured by Beer and Maedler. Dr. Weinek finds that the object appears upon a plate taken on March 14, but only one kilometre in diameter—that is, about one-tenth the value assigned to it by the earlier observers. The crater has also been found on other plates, and Sig. Schiaparelli has testified to its reality. Four new objects—three craters, and the fourth an isolated elevation of some kind—have been found in the plain which extends to the south of Ariadaeus, between the bright crater-plain Cayley and the Silberschlag crater. Ten new craters can be detected in the typical walled plain Albategnius. All the rills observed to the west of Triesnecker can be seen to extend beyond the limits previously assigned to them, and to connect Ariadaeus, Hyginus, and Triesnecker with interlacing clefts. Judging from these results, we cannot but conclude that the photographs represent real advances in lunar photography.

Cometary Ephemerides.—The following ephemeris for Encke's comet is in continuation of that given on November 22, and is due to Dr. O Backlund. M. Schulhof's ephemeris, in the *Astronomische Nachrichten*, No. 3267, is used for Swift's comet:—

	Encke's Comet. *Ephemeris for Berlin Midnight.*		Swift's Comet. *Ephemeris for Paris Midnight.*	
1894.	R.A. (app.) h. m. s.	Decl. (app.) ° ′ ″	R.A. (app.) h. m. s.	Decl. (app.) ° ′ ″
Dec. 28	22 14 57	+3 35 18	0 3 23	−0 20 22
30	14 27	3 19 58	0 8 33	0 17 53
Jan. 1	13 52	3 3 38	0 13 41	+0 53 45
3	13 9	2 45 51	18 46	1 33 10
5	12 16	2 26 7	23 49	2 10 9
7	11 8	2 3 47	28 51	2 46 41
9	9 42	1 38 1	33 50	3 22 44
11	7 52	1 7 53	38 48	3 58 19
13	5 31	+0 32 10	43 43	4 33 24
15	2 32	−0 10 34	48 37	5 8 0
17	21 58 47	1 2 10	53 29	5 42 5
19	54 3	2 4 42	58 19	6 15 42
21	48 10	3 20 29	13 8	6 48 48
23	40 57	4 51 53	7 55	7 21 24
25	32 13	6 40 45	12 41	7 53 29
27	21 57	−8 47 28	17 26	8 25 4

It will be seen from these ephemerides that the two comets are in the same region of the sky, both being a few degrees south of Pegasus. Observations of the comets are greatly needed.

Russian Astronomical Observations.—The latest *Bulletin* (vol. xxxv. No. 4) of the Imperial Academy of Sciences at St. Petersburg is almost entirely devoted to astronomical papers. E. Lindemann contributes a discussion of the visual and photographic magnitudes of Nova Aurigæ, and gives a light-curve extending from December 10, 1891, to April 13, 1892. N. Nyren discusses the observations made at Pulkova with the vertical circle, between 1882 and 1891, from the point of view of variations of latitude. The curves derived from the observations indicate that the interval between two maxima is 433 days, and between two minima, 434 days. As to the amplitude of the variation, though no definitive result is stated, the value of the radius of the circle described by the instantaneous pole appears to be 0″·145, and the direction of